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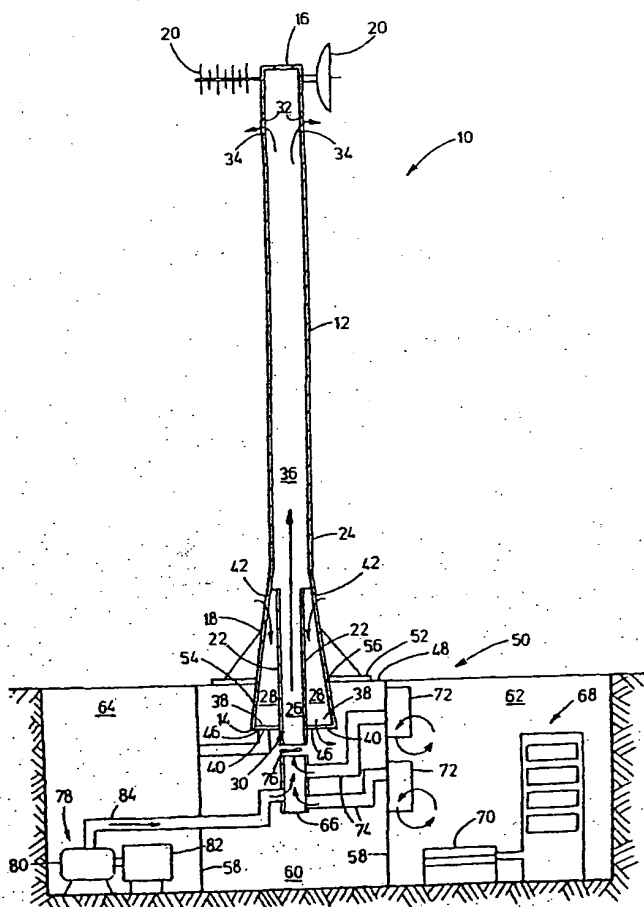
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(54) Title: COMMUNICATIONS MAST ASSEMBLY



(57) Abstract: This invention provides a communications mast assembly comprising a mast (10) extending from a submersible communications equipment housing (50). The mast has a first inlet port (42) spaced from the base of the mast; a first outlet port (38) communicating with the inside of the housing; a first inlet passage (44) extending from the first inlet port to the first outlet port; a second inlet port (30) also communicating with the inside of the housing; a second outlet port (32) spaced from the base of the mast; and a second outlet passage (36) extending between the second inlet and the second outlet. The arrangement is such that air flows into the housing via the first inlet passage to cool the inside of the housing and heated air is extracted from the housing via the second outlet passage.

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COMMUNICATIONS MAST ASSEMBLY

INTRODUCTION AND BACKGROUND TO THE INVENTION

This invention relates to a communications mast assembly.

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Canadian aesthetic design registration reveals a communications tower with an underground or submerged storage room connected to a tower structure. The underground room is provided with a separate ventilation unit for providing ventilation and cooling of equipment disposed in the submerged room. A

10 disadvantage of this tower is that the ventilation unit is located above ground level, thus obviating some of the advantages presented by having the equipment room submerged underground.

USA patent 6,173, 537 discloses a tower assembly including a tower portion
15 serving as an antenna carrier and having a base of relatively wider diameter defining a housing for electronic equipment. The tower assembly is hollow and the base is provided with an air inlet. An air outlet is provided in a top section of the tower portion, the arrangement being such that air is sucked into the inlet and flows along the inside of the tower assembly to cool the electronic
20 equipment (via a heat exchanger unit) and is dispensed via the air outlet.

A disadvantage of a tower assembly of this type is that, owing to the location of the air inlet in a side wall of the base of the tower assembly, the base cannot be

submerged below the ground. Further disadvantages of the tower assembly of this type are therefore that the base is exposed to unauthorised access and owing to the appearance and bulkiness of the base, it has a negative impact on the environment.

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OBJECT OF THE INVENTION

It is therefore an object of the present invention to provide a communications mast assembly with which the aforesaid disadvantages can be overcome or at least minimised.

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SUMMARY OF THE INVENTION

According to the invention there is provided a communications mast assembly comprising a mast extending from a submergible communications equipment housing, the mast having a first inlet port spaced from the base of the mast; a first outlet port communicating with the inside of the housing; a first inlet passage extending from the first inlet port to the first outlet port; a second inlet port also communicating with the inside of the housing; a second outlet port spaced from the base of the mast; and a second outlet passage extending between the second inlet and the second outlet, the arrangement being such that air flows into the housing via the first inlet passage to cool the inside of the housing and heated air is extracted from the housing via the second outlet passage.

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Further according to the invention the mast is hollow and has at least one internal partition wall separating first and second regions within the interior of the mast.

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The first region may define the inlet passage and the second region may define the outlet passage.

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The inlet and outlet passages may extend generally parallel to the longitudinal axis of the mast.

At least a portion of the mast may converge inwardly from the base towards the top of the mast.

15

The first outlet port of the inlet passage and the second inlet port of the outlet passage may be defined in the lower section or base of the mast, spaced from the base.

20

The first inlet port of the inlet passage and the second outlet port of the outlet passage may be defined in a wall of the mast.

The communications mast may have defined therein a plurality of inlet passages.

The communications mast may further have defined therein and plurality of outlet ventilation passages, the arrangement being such that each inlet passage is provided with a first inlet port and a first outlet port and each outlet passage is
5 provided with a second inlet port and a second outlet port.

Further according to the invention the housing houses electronic communications equipment.

10 The housing may comprise a communications equipment room and an access and/or heat exchanger room, separated by a partition wall.

Further according to the invention the housing is intended to be submerged underground, in use, the housing having an access port defined in a roof slab or
15 side wall of the access room thereof.

In use, the communications mast may be positioned directly above the access room of the housing, with the base of the mast protruding into the housing through the access port thereof, the arrangement being such that the mast
20 provides ventilation ducts in the form of the inlet and outlet passages for the ingress and expulsion of atmospheric air to and from the housing.

The housing may house air-conditioning equipment, which is located in the access room of the housing, the arrangement being further such that the mast provides ventilation ducts in the form of the inlet and outlet passages for the ingress of atmospheric air to the air-conditioning equipment housed in the
5 access room of the housing and the expelling of heated air from the air-conditioning equipment into the atmosphere.

The flow of atmospheric air or heated air may be assisted by means of one or more fans.

10

The housing may further include additional rooms such as, for example, a generator room for housing an electricity generating set.

The inlet and outlet passages of the mast may be in fluid communication with
15 the generator room to provide for flow of air between the atmosphere and the generator room.

Further according to the invention, the mast is in the form of a lamppost.

20 Even further according to the invention, the mast forms part of a support for an advertising board.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of non-limiting examples with reference to the accompanying drawings wherein:

- figure 1: shows a longitudinal sectional side view of a communications mast assembly, in accordance with a first embodiment of the invention;
- figure 2 shows a longitudinal sectional side view of the communications mast assembly according to a second embodiment of the invention;
- figure 3 shows a longitudinal sectional side view of the communications mast assembly of figure 2 having an alternative configuration of air-conditioning equipment; and
- figures 4 and 5 depict communications mast assemblies according to further embodiments of the invention.

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DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

In the drawings, a communications mast assembly in accordance with the invention comprises a communications mast generally designated by reference numeral 10 operatively extending upwardly from a communications equipment housing generally designated by reference numeral 50.

Referring to figures 1 to 3, the communications mast 10 is an elongate hollow tubular steel member 12 having a base 14 and an opposed top end 16. The mast 10 has an operatively lower portion 18 adjacent, but spaced from its base 14. Communications antennae 20 are attached to the mast 10 adjacent to its top end 16.

A pair of parallel spaced partition members 22 is arranged within portion 18 of the mast 10 and welded to the interior of the mast wall 24. Thus, the partition members 22 separate the interior of the mast 10 into a central region 26 intermediate opposed side regions 28.

A pair of first outlet ports 38 is defined in the base 14 of the mast 10 at the side regions 28 thereof to provide outlets 40 from the side regions 28. Further, a pair of first inlet ports 42 is defined in the lower portion 18 in the mast 10, each first inlet port 42 leading into a respective side region 28 of the mast 10. Thus, a first inlet ventilation passage 44 is defined between each first inlet port 42 and an associated first outlet port 38 to define a fluid flow path between the inlet port 42 and the associated outlet port 38.

A second inlet port 30 is defined in the base 14 of the mast 10 leading into the central region 26 thereof. A pair of opposed second outlet ports 32 is defined in the mast wall 24 proximate the top end 16 thereof to provide outlets 34 from the central region 26 of the mast 10. Thus, the central region 26 of the mast 10

provides a second outlet ventilation passage 36 defining a fluid flow path between the second inlet port 30 and the outlet ports 32 of the central region 26 thereof.

- 5 A filter 46 is provided at each of the outlet ports 38 of the inlet passages 44.

The mast 10 is fixed to a roof 48 of the communications equipment housing 50 by means of a flange member 52. A base portion 54 of the mast 10 protrudes through the roof 48 of the housing 50 via an access port 56 defined in the roof 10 48.

The embodiment of the communications equipment housing 50 shown in figure 1 comprises three rooms, separated from one another by a pair of spaced partition walls 58. The rooms comprise a ventilation and access room 60, a 15 communications equipment storage room 62, and a generator room 64. The mast 10 is fixed above the ventilation and access room 60. The inlet ventilation passage 44 of the mast 10 is extended by means of an extractor duct 66 attached to the base 14 of the mast 10 coaxially therewith.

- 20 The communications equipment storage room 62 houses electronic receiver and transmitter equipment 68, together with their associated power supplies. Further, the communications equipment includes an uninterruptible power supply and battery backup 70.

In figure 1, a pair of air-conditioner units 72 is mounted on the partition wall 58 between the ventilation room 60 and the communications equipment storage room 62. Each air-conditioning unit 72 is connected by means of ducting 74 to the extractor duct 66. Thus, it will be appreciated that atmospheric air at ambient temperature will be drawn into the inlet passages 44 of the mast 10 and, via the filters 46, into the access and ventilation room 60 of the communications equipment housing 50. Such air will be circulated through the air-conditioning units 72 and will be heated as heat is extracted by the air-conditioning units 72 from the communications equipment storage room 62. Condenser discharge air is ducted via the extractor duct 66 and expelled into the atmosphere via the outlets 34 of the outlet passage 36 of the mast 10. An electrically operated fan 76 assists in forcing the hot air through the outlet passage 36 of the mast 10.

Further, in the embodiment shown in figure 1, the generator room 64 houses a generator set 78, comprising a motor 80 and an electricity generator 82. Atmospheric air is ducted from an inlet passage 44 via its associated filter 46 into the generator room 64. Exhaust gases from the motor 80 of the generator set 78 are expelled from the generator room 64 via ducting 84 connected to the extractor duct 66 of the mast 10.

We turn now to figure 2, in which, with reference to figure 1, like numerals indicate like components, unless otherwise specified. In figure 2, an air-

conditioning unit is installed in the ventilation and access room 60 of the communications equipment housing 50. The air-conditioning may be in the form of a commercial air conditioning system. Alternatively the air-conditioning may be in the form of a water-cooled system as provided in the drawings. The air-conditioning unit may optionally include a water chiller 88 above which is mounted a housing 90 containing a compressor and condenser coil (not shown).

Once again, atmospheric air at ambient temperature is introduced into the ventilation and access room 60 via the inlet passages 44 and heated air from the air-conditioning unit is expelled from the ventilation room 60 via the extractor duct 66. Again, the expelling of heated air is assisted by means of an electrically driven fan 76. In the water-cooled air conditioning system, the water chiller 88 is connected by means of water piping 92 to a ceiling mounted heat exchanger 89 in the communications equipment room 62. Air from the communications equipment room 62 is cycled through the heat exchanger 89 over chilled water coils if such water cooled system is used (not shown).

We turn now to figure 3, in which, with reference to figures 1 and 2, like numerals indicate like components, unless otherwise specified. In figure 3, a further alternative air-conditioning system 92 is illustrated. The air-conditioning system 92 comprises a split unit type air-conditioner in which a heat exchange unit 98 is fixed to the partition 58 between the ventilation and access room 60 and the communications equipment storage room 62. The heat exchange unit

98 is connected by means of piping 102 to a condenser unit 104 of the air-conditioning system 92. The condenser unit 104 is connected to the extractor duct 66 of the outlet passage 36 of the mast 10, by means of ducting 106. As with the previous embodiment, the expelling of heated air is assisted by means
5 of an electrically operated fan 76.

In the drawings, air flow is indicated by means of unlabelled arrows.

By means of the invention there is provided a communications mast 10 which
10 serves the additional purpose of providing ventilation passages 36, 44 for a communications equipment housing 50. The housing 50 may conveniently be buried so that it is out of sight and also to improve the security thereof. The use of an integral mast 10 and ventilation system obviates the need for conventional vents, which may be subject to damage or tampering. Further, the number of
15 unsightly objects at the site of the communications facility is reduced.

In figures 4 and 5, communications mast assemblies according to further embodiments of the invention are depicted. These assemblies are similar to the mast assemblies according to the other embodiments of the invention described
20 above except for the following. The mast portion 10 of the assembly shown in figure 4 is provided in the form of a lamppost. The mast portion 10 of the assembly shown in figure 5 provides a support for an advertising board. It will be appreciated that owing to the fact that the housings 50 of these assemblies are

located underground, and the mast portions 10 are camouflaged in the form of commonplace articles, the impact that the mast assemblies according to these embodiments will have on the environment will be minimal.

- 5 It will be appreciated further that variations in detail are possible with a communications mast assembly according to the invention without departing from the scope of the appended claims.

CLAIMS

1. A communications mast assembly comprising a mast extending from a submergible communications equipment housing, the mast having a first inlet port spaced from the base of the mast; a first outlet port communicating with the inside of the housing; a first inlet passage extending from the first inlet port to the first outlet port; a second inlet port also communicating with the inside of the housing; a second outlet port spaced from the base of the mast; and a second outlet passage extending between the second inlet port and the second outlet port, the arrangement being such that air flows into the housing via the first inlet passage to cool the inside of the housing and heated air is extracted from the housing via the second outlet passage.
2. A communications mast assembly according to claim 1 wherein the mast is hollow and has at least one internal partition wall separating first and second regions within the interior of the mast.
3. A communications mast assembly according to claim 2 wherein the first region defines the inlet passage and the second region defines the outlet passage.

4. A communications mast assembly according to claim 3 wherein the inlet and outlet passages extend generally parallel to the longitudinal axis of the mast.
- 5 5. A communications mast assembly according to claim 4 wherein at least a portion of the mast converges inwardly from the base towards a top of the mast.
6. A communications mast assembly according to claim 5 wherein the first
10 outlet port of the inlet passage and the second inlet port of the outlet passage are defined in the base of the mast.
7. A communications mast assembly according to claim 6 wherein the first
15 inlet port of the inlet passage and the second outlet port of the outlet passage are defined in a wall of the mast spaced from the base.
8. A communications mast assembly according to claim 7 wherein the communications mast has defined therein a plurality of inlet passages.
- 20 9. A communications mast assembly according to claim 8 wherein the communications mast further has defined therein a plurality of outlet ventilation passages, the arrangement being such that each inlet passage is provided with a first inlet port and a first outlet port and each

outlet passage is provided with a second inlet port and a second outlet port.

- 5 10. A communications mast assembly according to any one of the preceding claims wherein the housing houses electronic communications equipment.
- 10 11. A communications mast assembly according to claim 10 wherein the housing comprises a communications equipment room and an access and/or heat exchanger room, separated by a partition wall.
- 15 12. A communications mast assembly according to claim 11 wherein the housing is intended to be submerged underground, in use, the housing having an access port defined in a roof wall of the access room thereof.
- 20 13. A communications mast assembly according to claim 12 wherein, in use, the communications mast is positioned directly above the access room of the housing, with the base of the mast protruding into the housing through the access port thereof, the arrangement being such that the mast provides ventilation ducts in the form of the inlet and outlet passages for the ingress and expulsion of atmospheric air to and from the housing.

14. A communications mast assembly according to claim 13 wherein the housing houses air-conditioning equipment, which is located in the access room of the housing, the arrangement being further such that the mast provides ventilation ducts in the form of the inlet and outlet passages for the ingress of atmospheric air to the air-conditioning equipment housed in the access room of the housing and the expelling of heated air from the air-conditioning equipment into the atmosphere.
15. A communications mast assembly according to claim 14 wherein the flow of atmospheric air or heated air is assisted by means of at least one fan.
16. A communications mast assembly according to claim 15 wherein the housing includes additional rooms such as, for example, a generator room for housing an electricity generating set.
17. A communications mast assembly according to claim 16, wherein the inlet and outlet passages of the mast are in fluid communication with the generator room to provide for flow of air between the atmosphere and the generator room.
18. A communications mast assembly according to any one of the preceding claims wherein the mast is in the form of a lamppost.

19. A communications mast assembly according to any one of claims 1 to 17 wherein the mast forms part of a support for an advertising board.
- 5 20. A communications mast assembly substantially as herein described and as illustrated in the accompanying drawings.

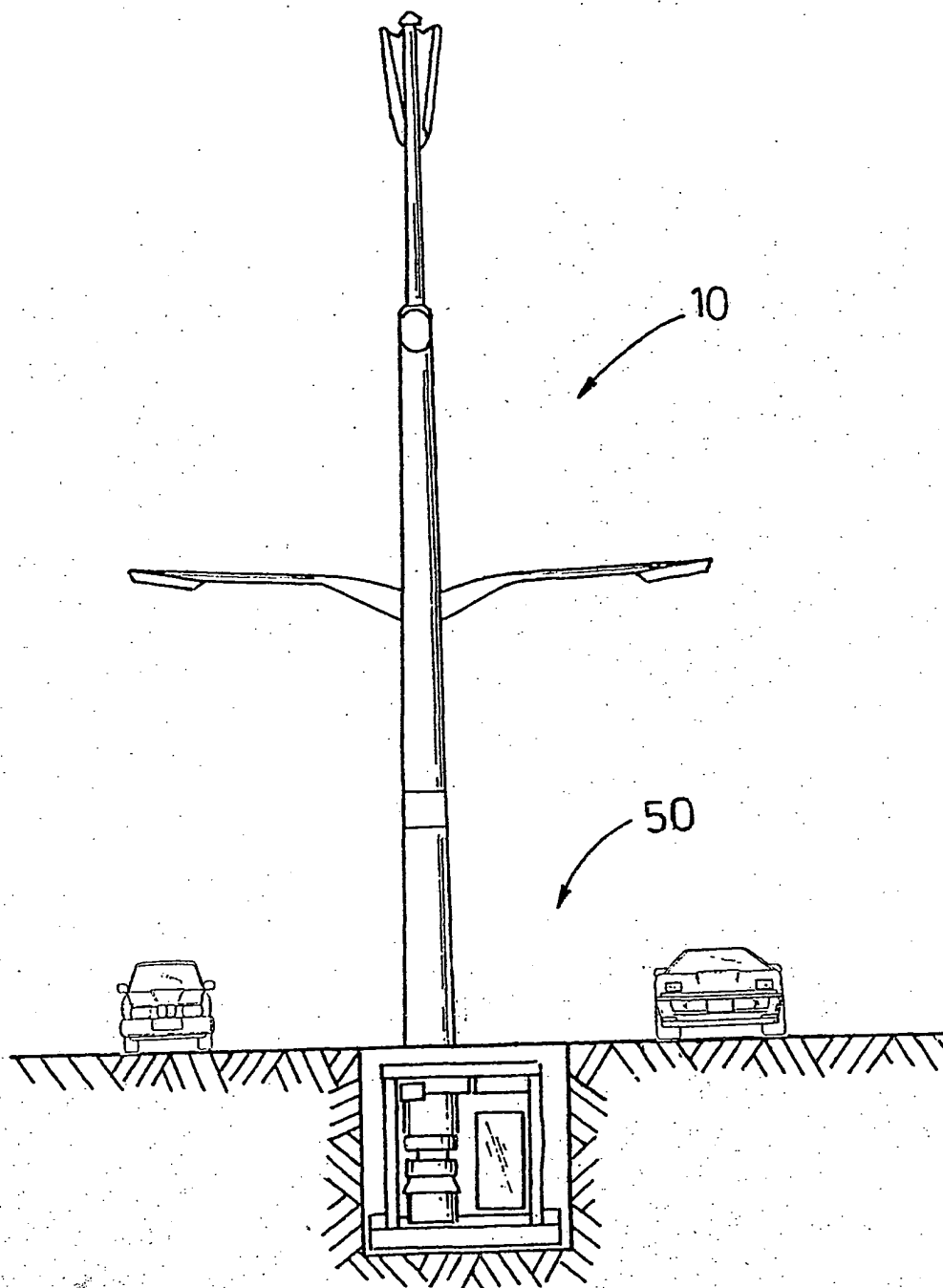
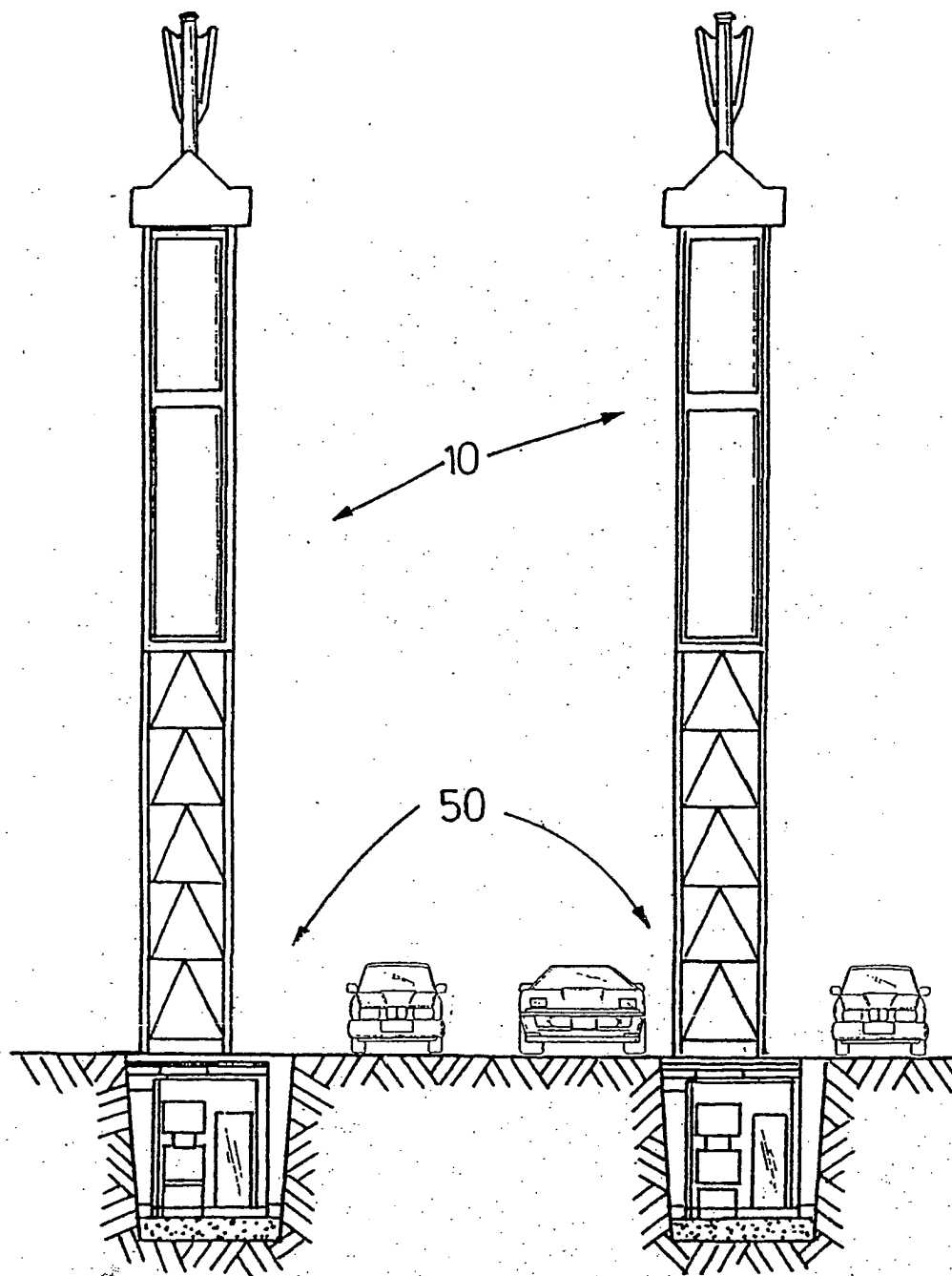


FIGURE 4

FIGURE 5

INTERNATIONAL SEARCH REPORT

International Application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01Q1/12 H01Q1/24 E04H12/22 H05K7/20 H04B1/036

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01Q E04H H05K H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 950 712 A (WENDELL PAUL ET AL) 14 September 1999 (1999-09-14)	20
A	column 3-7; figures 1,2	1
X	WO 95 16840 A (MAFI AB ; TRANSMAT LTD (FI); DAVIDSSON MIKAEL (SE); MIETTINEN HEIK) 22 June 1995 (1995-06-22)	20
P, X	page 3-6; figure 1 & US 6 173 537 B1 (MIETTINEN HEIKKI ET AL) 16 January 2001 (2001-01-16)	20
A	cited in the application	1
X	GB 2 289 827 A (MOTOROLA LTD) 29 November 1995 (1995-11-29)	20
A	page 4; figures 2,3	1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5950712	A	14-09-1999	NONE	
WO 9516840	A	22-06-1995	SE 503948 C2 AU 1286295 A CA 2178731 A1 EP 0734481 A1 SE 9304181 A WO 9516840 A1 US 6173537 B1	07-10-1996 03-07-1995 22-06-1995 02-10-1996 16-06-1995 22-06-1995 16-01-2001
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